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Boxwoods of commerce*

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(WITH ONE TEXT FIGURE)

TURKISH BOXWOOD

The original boxwood of commerce, commonly called Turkish boxwood, is supplied by *Buxus sempervirens* L. (Euphorbiaceae). This species (including closely related forms) has an extensive range throughout central and southern Europe, northern and western Asia, and northern Africa. It is a small tree at best and in parts of its range is reduced to a low shrub valued chiefly for ornamental purposes. The commercial range corresponds roughly to that of the Circassian or Persian walnut and the principal port of origin for wood shipments is Batum.

The wood has been used and prized for many centuries. Its very fine and uniform texture, its light and yellowish color, the ease with which it can be shaped or carved in spite of its horn-like density and irregular grain,[†] together with its freedom from warping and splitting when finished, have combined to give to this wood a unique place in a specialized field. For the more exacting uses, such as fine engravings, there is no satisfactory substitute.

The wood is not all of the same degree of excellence. The Abassian is considered the best on the American market, followed by the Anatolian and Persian in the order named. Most of the wood used by the Japanese is said to come from Siam and Burma. It is not so highly prized as the native wood (*Buxus japonica* Muell.), is considerably lighter in color, and the bitter taste is much less pronounced. The war stopped shipments of Turkish boxwood and they have not yet (1921) been resumed.

SOUTH AFRICAN BOXWOODS

The growing scarcity of Turkish boxwood stimulated search for substitutes, and in 1885 the East London or Cape boxwood

* Contribution from the Yale School of Forestry, No. 14.

† "There is no . . . box so knotty that dipped in oil cannot be carved." John Lyly: *Euphues and his England*, p. 368.

was introduced into the trade from eastern Cape Colony, South Africa. This is a true boxwood, *Buxus Macowani* Oliv., and is suitable for engraving, though less highly esteemed than the Turkish for this purpose. The preference for the latter is shown by the fact that block-makers are salvaging used blocks, cutting them into thin layers and gluing these to hard maple backs to get the proper height.

Another wood out of Cape Colony is the Kamassi or Knysna boxwood, also known as East London and Cape boxwood. This is produced by *Gonioma Kamassi* E. Mey. of the family Apocynaceae, which contains many fine-textured woods. The Dutch name is "kamassi" or "kamassihout." Although the wood has a fine and uniform texture it is not adapted for engraving and has found its principal use in the weaver's trade for shuttles and bobbins. It has practically disappeared from the New York market.

TROPICAL AMERICAN BOXWOODS

Much of the boxwood of commerce is now supplied by the forests of the American tropics under the general name of "West Indian boxwood." There has been much confusion regarding the identity of the species producing this material. In most works of reference it is erroneously referred to *Tecoma pentaphylla* Juss. (= *Tabebuia pentaphylla* Hemsl.) of the family Bignoniaceae. This mistake arose about 1884, apparently as the result of the incorrect labeling of a wood specimen in the museum at Kew, England. The wood actually produced by this tree has none of the properties of boxwood and is locally known as "roble" (oak), name giving some idea of its appearance.

In 1880, A. Ernst published a note in the *Botanisches Centralblatt* to the effect that the tree supplying the boxwood of Venezuela was *Aspidosperma Vargasii* DC. (Apocynaceae). He gave the local name as "amarilla yema de huevo," referring to the resemblance of the color of the wood to that of the yolk of an egg.

In 1914, Sprague and Boodle contributed a paper to the *Kew Bulletin of Miscellaneous Information* in which they established the identity of certain specimens of West Indian or Venezuelan boxwood as *Casearia praecox* Griseb. (Samydaceae or Flacourtiaceae). They expressed the opinion that the wood referred to

by Ernst as *Aspidosperma Vargasii* and by others as *Tabebuia pentaphylla* was in reality *Casearia praecox* or some closely related species of this genus.

"ZAPATERO" AND "AMARILLO" OF VENEZUELA

The present writer finds that instead of one there are at least three so-called West Indian boxwoods on the market. The principal one is, as Sprague and Boodle state, *Casearia praecox*. This is the "zapatero" of Venezuela. Whether or not Ernst was right in referring the particular specimen he described to *Aspidosperma Vargasii* (his description indicating *Casearia*), it seems definitely established that this species has produced considerable quantities of boxwood, though it is now almost if not entirely out of the American market. There is evidence available that there is at least one other species of *Aspidosperma* in Venezuela producing "amarillo," as the wood of that genus is locally known. There are still other species in Brazil which are in the boxwood class, particularly *A. eburneum* All., the "piquia marfim." *Esenbeckia Atata* Pittier (Rutaceae) has many properties in common with the zapatero and the amarillo but, so far as known to the writer, this wood is not on the market.

"BAITOA" OR SAN DOMINGAN BOXWOOD

The third West Indian boxwood is from Santo Domingo. This first came to the writer's attention in 1918 in the form of a battery commander's ruler. The wood proved to have the same structure as the "palo lanza" or "guayabi amarillo" of northern Argentina. Through the courtesy of the Director of the New York Botanical Garden the writer was able to establish the identity of these woods as *Phyllostylon brasiliensis* Capanema (= *Phyllostylon rhamnoides* Taubert = *Samaroceltis rhamnoides* Poisson) of the family Ulmaceae. This identification has since been confirmed by Mr. C. D. Mell, who at the writer's suggestion made some observations on the species while on a trip to Haiti. This tree, of which there is supposed to be only a single species, is known to occur in Argentina, Brazil, eastern Cuba, Santo Domingo and Haiti. See FIG. 1.

The wood reaches the New York market in considerable quan-

tity from Santo Domingo, where it is known as "baitoa" and sometimes as "bois blanc." There is not much information available regarding its distribution, but it is known to occur in the val-

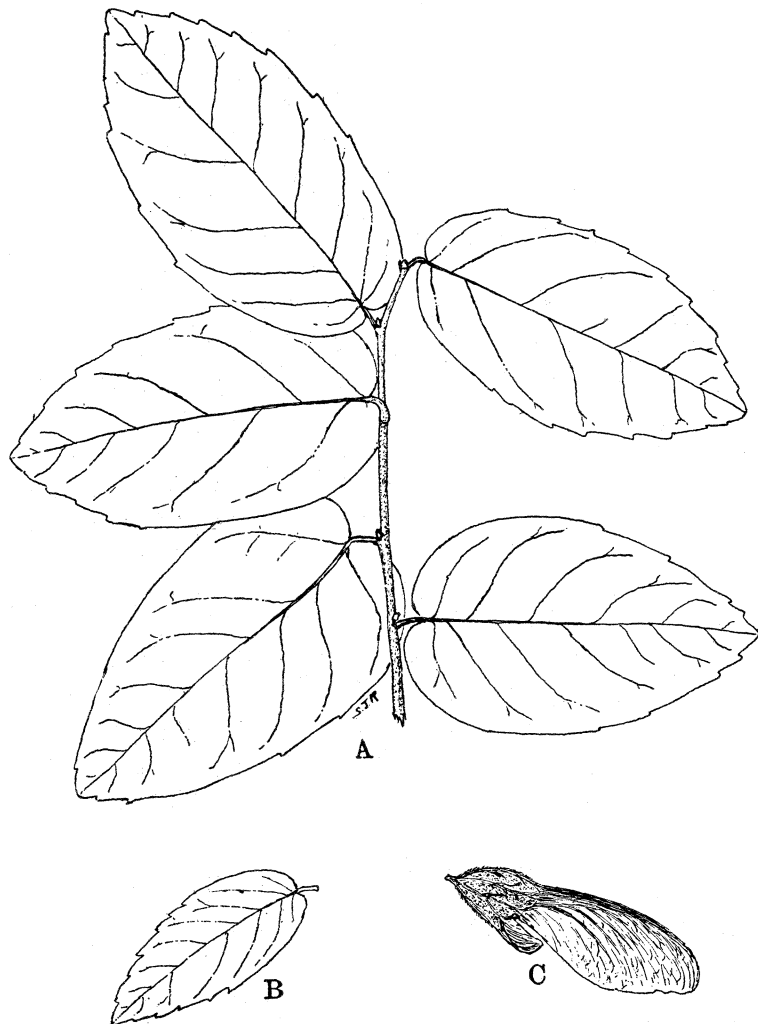


FIG. 1. *PHYLLOSTYLON BRASILIENSIS* Capanema. A. Twig and leaves from Haiti. B. Smaller leaf from Oriente, Cuba. C. Fruit from Cuba. All natural size.

leys of the Yaque del Norte and Yaque del Sur, where it is a common tree in small pure stands or in mixture with other trees. It reaches there a diameter of 20 inches and is from 50 to 70 feet

high. Mr. Mell found it quite abundant in parts of Haiti, where it reaches the same dimensions and has the same habits as above mentioned. A common characteristic noted is the fluted trunk and the presence of abundant epiphytes on the branches. The wood is little used locally. The following is from his notes:

The "bois blanc" is one of the most common trees in the dry calcareous regions of the west and north of the island and is said to be most plentiful in the flat and arid regions south of Gonaives in Haiti and on the low dry foothills and lower slopes of the mountains around Puerto Plata in Santo Domingo. Only rarely is it found on the upper slopes and tops of the mountains. It appears to prefer the flat lands that are dry and rocky where it is often found growing thickly in pure forest.

The crowns of the trees are so open that in the pure stands the sunlight reaches the ground and the trees are accordingly rather short boled. In mixture with other trees casting a denser shade the height is greater and occasional specimens may be seen that are 30 feet to the first large limb and as much as 18 inches in diameter breast high. Usually the trunks are irregular and few of them are suitable for lumber.

The leaves are small and not very numerous. Every tree, regardless of its site or associates, seems to be full of epiphytic plants which appear to interfere with its development.

The wood is not esteemed very highly by the natives except for making fence posts and square timbers for buildings of all kinds. Only the smaller sizes are used and the large trees do not seem to be cut for any purpose.

The San Domingan boxwood is inferior to both of the woods from Venezuela. It is not suitable for engraving but makes satisfactory shuttles (its principal use at present) and a fair grade of rulers. It varies in color from very light to canary yellow or light brown. An interesting feature of its structure is the presence of calcium carbonate in a large proportion of the vessels, readily visible with the lens and sometimes without it. The effervescence resulting from the application of a drop of hydrochloric acid to the end of a specimen affords a very simple and reliable means of separating this wood from the others of the group.

SOME OTHER WOODS CALLED BOXWOOD

The flowering dogwood, *Cornus florida* L. (Cornaceae), is sometimes called American boxwood, presumably because of its use in the place of the true boxwood for shuttles. Since the color is reddish or greenish instead of yellowish and the rays are pronounced there is no occasion to confuse it with the other woods of the group. *Schaefferia frutescens* Jacq. (Celastraceae), a small tree of southern Florida and the West Indies, is sometimes known as boxwood but it does not enter the market.

In Australia the name box is applied to various species of *Eucalyptus* and to *Tristania conferta* R. Br. (Myrtaceae). The structure of these woods is distinct from the boxwoods of commerce. The writer is as yet unable either to verify or disprove the statement often met with that the boxwood of the Bahamas is *Vitex umbrosa* Sw. (Verbenaceae). Apparently there is no such wood on the market.

USES OF BOXWOOD

The principal uses of boxwood are for engraving, manufacture of mathematical instruments, shuttles, turnery, musical instruments, and in the form of veneer for inlay and marquetry. The Japanese use it for making combs. Jewelers use wheels of it for burnishing and the sawdust for polishing. There was formerly considerable demand for it by makers of roller skates. The manufacture of boxwood spools for wires in telephone boxes made use of considerable small Turkish boxwood sticks but composition spools have replaced the wooden ones.

The use of wood engravings persists in spite of the advance of other methods. The number of engravers in the United States is said to be about 200 of whom 150 are located in Chicago. The blocks are cut edge-grain and are seven eighths inch high. The best blocks measure 2 x 2 inches free of the pith and can only be procured from logs measuring not less than 4½ inches in diameter. Cuttings from these blocks are built up into blocks of any desired size. Small defects may be bored out and plugged.

APPEARANCE OF BOXWOOD LOGS

The boxwoods are imported in the form of logs or small sticks. The Turkish, East London, and Knysna varieties look like cordwood in the round and are usually very knotty and crooked. The material is usually sorted as to sizes in the yards of the dealers, and Turkish boxwood sticks as small as one inch in diameter are merchantable.

The logs of Venezuelan boxwoods are 8 to 12 feet long, mostly straight, smooth and round, and vary in diameter from 6 to 20 inches, mostly 6 to 10 inches. The larger logs are commonly sawed in half lengthwise and stored in dry sheds to prevent splitting.

The "baitoa" logs from Santo Domingo are from 8 to 20 inches in diameter and 10 or 12 feet in length. They are irregular, and may be more or less fluted. The more prominent irregularities are usually hewn off. A pile of this material resembles a lot of sugar maple logs.

Boxwood logs are measured at the small end, usually outside the bark. Owing to the tendency of the West Indian boxwoods to discolor in a humid atmosphere it is necessary to store the logs in a dry shed.

BARK CHARACTERS OF THE BOXWOODS

The bark characters of the different woods are distinctive. In *Buxus sempervirens* the bark is extremely thin, usually not more than $\frac{1}{16}$ inch, is gray in color, and clings tightly to the wood. In *B. Macowani* it is rather thick, $\frac{1}{8}$ to $\frac{1}{4}$ inch, composed of an inner dark layer and an outer lighter corky layer in narrow longitudinal ridges suggesting white ash.

In *Gonioma Kamassi* the bark is about $\frac{1}{4}$ inch thick, shows two distinct layers the outer of which is yellow on cross-section but grayish on the surface, irregularly fissured and somewhat flaky.

Aspidosperma Vargasii has a bark about $\frac{1}{4}$ inch thick, with a thick deep-yellow inner layer and a thin outer layer composed of laminations alternating light and dark. There are no concentric lines in the inner bark and the phloem rays are scarcely distinct with a lens. The outer surface shows large splotches of gray, has short horizontal fissures and very irregular shallow vertical ones.

In *Casearia praecox* the bark is from $\frac{1}{8}$ to $\frac{3}{16}$ inch thick, indistinctly two-layered, the outer being thin, smoothish, brown or mottled, and with fine vertical wrinkles in the smaller sizes and flaking off irregularly to a light gray without furrows in the larger. Inner bark has distinct wedge-shaped rays and concentric zones, and, when fresh, exudes a resin which stains the edge of the wood.

In *Phyllostylon brasiliensis* the bark is from $\frac{3}{16}$ to $\frac{7}{16}$ inch thick, without distinct layers. The outer surface in young specimens is greenish-gray, somewhat wrinkled, and with prominent lenticels which may be elongated horizontally; in large logs the color is ashy gray, smoothish-granular or with irregular corky ridges. The inner bark shows numerous fine wavy rays and very fine

concentric lines, and with irregular wedge-shaped patches here and there extending from the outer surface to varying depths. The inner surface shows a storied structure more or less distinctly under the lens. The number of ripple marks per inch of length is about 140.*

Descriptive key to the boxwoods of commerce

(Microscopic features)

- A. Vessel perforations scalariform (mostly 5–10 bars). Wood parenchyma diffuse and in short tangential rows; no concentric lines. Rays heterogeneous; large cells thick-walled; pits into vessels small, half-bordered. Fibers without gelatinous layer; often arranged in fairly definite radial rows, and somewhat flattened at termination of growth rings. Pores open, well distributed, single, rounded, mostly under 0.03 mm. (tang. diam.). Vessel pits small, border circular, aperture very small, dot-like. Growth rings defined by narrow pore-less zones.
 - a. Wood fibers with inconspicuous, indistinctly bordered pits. Rays 1–3, mostly 1 or 2, cells wide; 1–15, in some specimens 1–30, cells high; max. 0.02 mm. \times 0.25 – 0.40 mm. TURKISH BOXWOOD; *Buxus sempervirens* L.
 - b. Wood fibers with distinctly bordered pits; sometimes very prominent. Rays 1–3, mostly 2, cells wide; 1–20, mostly 8–10, cells high; max. 0.02 mm. \times 0.17 mm. EAST LONDON or CAPE BOXWOOD; *Buxus Macowani* Oliv.
- B. Vessel perforations simple.
 - a. Wood parenchyma absent or very rare. Rays narrow, 1–3 cells wide; crowded; few to 75 cells high; max. 0.03 mm. \times 1.5 mm.; heterogeneous; crystals very common; pits into rays very small, half-bordered, with lattice-like appearance. Fibers with gelatinous layer in part; often in definite radial rows due to crowding of rays; sometimes falsely septate with resin-plates; pits simple but often conspicuous. Middle lamella often very thick at corners and of a deep yellow color. Pores open, arranged mostly in radial rows of 2–8, usually 2–4; commonly not flattened; mostly under 0.04 mm. (tang. diam.). Vessel pits very small with slit-like apertures which may extend beyond borders and appear to coalesce into spirals. Growth rings present but more distinct under simple lens than under compound microscope. ZAPATERO, or (COMMON) WEST INDIAN or VENEZUELAN BOXWOOD; *Casearia praeox* Griseb.
 - b. Wood parenchyma present and distinct. Rays rarely 40 cells high.
 - a¹. Rays homogeneous or nearly so; mostly uniseriate; 1–20 cells high; max. 0.01–0.02 mm. \times 0.30 mm.; pits into vessels half bordered. Parenchyma diffuse; rarely in tangential lines except at margins of growth rings. Fibers without gelatinous layer; some tendency to radial arrangement; pits distinctly bordered. Pores single; comparatively large; larger pores 0.06–0.07 mm. (tang. diam.); open. Vessel pits comparatively large with apertures extending beyond borders. Growth rings defined by narrow pore-less zones. AMARILLO, or VENEZUELAN BOXWOOD; *Aspidosperma Vargasii* DC.

* The only other member of this family (Ulmaceae) in which ripple marks are known to occur is *Holoptelea integrifolia* (Roxb.) Planch.

- b*¹. Rays heterogeneous; 1-4, mostly 2-3, cells wide; 1-30 or 1-40 cells high. Parenchyma in tangential lines.
- a*². Wood fibers with thick gelatinous layer and yellowish granular contents; no radial arrangement; pits small, indistinct, simple. Pores in part filled with calcium carbonate; sometimes with tyloses; arranged singly or in radially compressed rows of 2-5; larger pores 0.04-0.05 mm. (tang. diam.). Vessel pits comparatively large with elongated apertures; segments in horizontal seriation (tangential section) with parenchyma strands (mostly 2 cells per strand), and with low rays. High rays usually constricted slightly at junction of tiers (2 to 5 per ray); width 0.025-0.04 mm., heights in multiples of about 0.17 or 0.18 mm. up to five; pits into vessels large, simple to distinctly bordered; crystals common. Growth rings limited by line of wood parenchyma; slight difference in density. *BAITOA*, or *SAN DOMINGAN BOXWOOD*; *Phyllostylon brasiliensis* Cap.
- b*². Wood fibers without gelatinous layer and without contents; tendency to radial arrangement; pits distinctly bordered. Pores open or with yellowish gum contents; arranged singly or occasionally in pairs; larger pores about 0.04 mm. (tang. diam.). Vessel pits very small; segments not in horizontal seriation. Rays 1-30 cells high; max. 0.03-0.04 mm. \times 0.6 mm.; pits into vessels small, half bordered, lattice-like appearance; many cells with yellow contents; no crystals observed. Growth rings due to narrow pore-less zones. *KNYSNA* or *KAMASSI BOXWOOD*; *Gonioma Kamassi* E. Mey.

CHECK LIST OF THE COMMON NAMES OF THE BOXWOODS

Buxus sempervirens: Box, boxwood, Turkish boxwood (general); Abassian, Anatolian, Circassian, Corsican, English, Parthenian, Persian, and Turkish boxwoods (trade); buis, buis commun, buis beni (French); gemeine Buchsbaum, Buchsbaumholz, Buchsholz (German); buxo, madeira de buxo (Portuguese); boj, madera de boj (Spanish); bosso, bosso comun, bossolo (Italian); boksboom, boksboomhout, busboom (Dutch); buxbom, buxbomsträ (Swedish); boksboom buksbom (Danish); tsuge, hon-tsuge, asama-tsuge, benten-tsuge, kara-tsuge, detchiki (Japan); wong-yong, huan-yang (China); fang-guyan-gmok (Korea); shanda laghúne (Afghanistan); chikri (Kashmir); papri, papar, paprang, shamshad, shumaj (Punjab); shibsashin (Byans); box (Anglo Saxon); buxus (Latin); teasshur (Hebrew).

Buxus Macowani: Cape boxwood, East London boxwood, African boxwood (Trade).

Gonioma Kamassi: Kamassi boxwood, Knysna boxwood, East London boxwood, Cape boxwood (trade); kamassi, kamas-sihout (Dutch).

Casearia praecox: West Indian boxwood, Venezuelan boxwood, Maracaibo boxwood (trade); India boxwood (European trade); zapatero, sapatero, naranjillo (?), limoncillo (?) (Venezuelan); raspalenga (?), zapatero (Cuba); buis d'Amérique (French).

Aspidosperma Vargasii: West Indian boxwood, Venezuelan boxwood (trade); amarillo, amarilla yema de heuvo (Venezuelan).

Phyllostylon brasiliensis: San Domingan boxwood (trade); baitoa, bois blanc (Santo Domingo); bois blanc (Haiti); pao branco (Brazil); ibirá-katú, ibirá-catú, palo lanza, palo lanza negro, yaó-si-guazú, tala grande, palo amarillo (Argentina).